IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of

PATRICK ARACHEQUESNE

Serial No.: 10/791,827

Filed: March 4, 2004

For: MOUNTING A HOLOGRAPHIC SIGHT ON A FIREARM

Group Art Unit 3641
Michelle Renee Clement, Examiner

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Patricia Oakes, Secretary to Edward G. Greive

AMENDED APPEAL BRIEF PURSUANT TO 37 C.F.R. 41.37

Board of Patent Appeals and Interferences
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an appeal to the Board of Patent Appeals from the rejections in the final Office Action mailed September 11, 2007. The Notice of Appeal was mailed on March 10, 2008. A Petition to Withdraw an erroneous holding of abandonment was granted on June 16, 2008. The present appeal is of claims 49-56 and 58-60.

I. Real party in interest

The real party in interest is the inventor, Patrick Arachequesne.

II. Related appeals and interferences

Not applicable.

III. Status of claims

Claims 1-48 and 57 have been cancelled. Claims 49-56 and 58-60 have been rejected under 35 U.S.C. § 103, and are all appealed.

IV. Status of amendments

Claim 57 was cancelled after final rejection. The Advisory Action mailed 1/18/2008 acknowledged this cancellation saying, "Applicant's cancellation of Claim 52 [*sic*] has overcome the section 112 rejection." No other amendments were made after final rejection.

V. Summary of claimed subject matter

The sole independent claim, claim 60, claims a firearm comprising at least one barrel having a muzzle end and an opposite end. A holographic sight device is mounted on the firearm closer to the muzzle end than the opposite end. (Page 1, ¶ 0002). As shown in Figs. 1 and 2, the holographic sight device 6 is mounted near the muzzle end of the barrel of an "over and under" style shotgun.

Mounting the holographic sight at or near the muzzle end of a firearm is a distinguishing characteristic of the claimed invention.

Claim 49 depends from claim 60 and claims, *inter alia*, "[t]he firearm of claim 60, wherein said holographic sight device is removably mounted on said firearm by means of removably mounting means, said removably mounting means comprising a groove, formed on said firearm, extending along a groove direction from a proximal end to a distal end and open at said proximal end, and a strip, fixed to said sight device and having a shape so as to be received and guided in said groove along said groove direction..." The removably mounting means includes a dovetail groove 5 that is formed in the spacer 4 connecting barrels 1 and 2 and is closed at the same end as the muzzle end of the barrels 1 and 2, as shown in Figs. 1 and 2 (Pages 6-7, ¶ 23). The removably mounting means also includes a dovetail-shaped strip 8 fixed to the sight device, as shown in Figs. 1 and 2, that is configured to fit in a dovetail groove 5 (Page 7, ¶ 25).

Claim 52 depends from claim 49 and recites "said removable mounting means." The removable mounting means recited in claim 52 is the same as the removably mounting means recited in claim 49.

Claim 54 depends from claim 53, which depends from claim 52, and recites "said mounting means." The mounting means recited in claim 54 is the same as the removable

mounting means recited in claim 52 and the removably mounting means recited in claim 49.

VI. Grounds of rejection to be reviewed on appeal

Claims 60 and 56 have been rejected[1] under 35 U.S.C. § 103(a) as being unpatentable over Booth ("Booth", U.S. Patent No. 6,671,990) in view of Tai et al. ("Tai '362", U.S. Patent No. 5,483,362). Non-patent literature was also cited[2] in the rejection of these claims.

Claims 49-55, 58, and 59 have been rejected[3] under 35 U.S.C. § 103(a) as being unpatenable over Booth and Tai '362 as applied to claim 60, and further in view of Sanders ("Sanders", U.S. Patent No. 5,046,277) and Tai et al. ("Tai '060", U.S. Patent No. 6,490, 060).

The rejection of all claims was confirmed in the Advisory Action mailed 1/18/2008.

VII. Argument

a. Rejection of claims 60 and 56 under 35 U.S.C. § 103(a)

Appellant maintains that the claimed invention is not obvious in view of the cited references. Neither Booth nor Tai '362 disclose a firearm having a holographic sight mounted on the firearm closer to the muzzle end than the opposite end. Moreover, none of the non-patent literature references discloses such an arrangement. The assertion that the claimed invention is obvious is belied by the fact that it is the singular practice in the art to mount a holographic sight near a shooter and away from the muzzle end of a firearm's barrel.

Booth does not teach a firearm having a holographic sight mounted near the muzzle end of the firearm. For that matter, one would not need to mount a holographic sight on the firearm disclosed in Booth because it already has a front sight assembly 28

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[1] Final Office Action mailed 9/11/2007 at paragraph 4.

[2] *Id.* These non-patent literature references are listed on the Notice of References Cited mailed with the Final Office Action (9/11/07), and include: (U) http://www.opticsplanet.net/bushnell-holosight.html (pgs. 1-5), (V) Ultimak (http://ultimak.com/UnderstandingE-sights.htm) (pgs. 1-14), (W) Holographic Weapon Sight Product Introduction, NDIA/EOTech presentation, June 2004, (X) Knights Armament Company (http://www.defensereview.com/article106.htm) (pgs. 1-3), and (U-page 2) National Defense (http://www.nationaldefensemagazine.org/issues/2004/Sep/Holographic.htm) (pgs. 1-2). Copies of these non-patent literature references are included in Appendix B to this Appeal Brief.

[3] *Id.* at paragraph 5.

that is used in conjunction with a rear sight on the receiver 11. And while Booth discloses a rail extension 70, the reference does not teach mounting a holographic sight on the rail extension, nor does the reference teach mounting a holographic sight closer to the muzzle end of the barrel than the opposite end.

Likewise, Tai '362 teaches the exact opposite of the claimed invention: It teaches a holographic sight mounted closer to the opposite end than the muzzle end of the barrel. Moreover, if one were to mount the holographic sight of Tai '362 on a firearm having the extension rail 70 of Booth, the combination of the references would not disclose the claimed invention. The holographic sight 20 of Tai '362 has a substantial base 24 and cover 26 that extend in the muzzle direction from the holographic device (which is contained within shroud 28). The rail extension 70 of Booth does not extend beyond handguard system 50', and the handguard systems 50' and 14 only extend down the barrel to tube cap 30. If one were to mount the holographic sight of Tai '362 at the farthest possible forward position on rail extension 70, the substantial base 24 and cover 26 could be placed no farther forward than before tube cap 30, and therefore the holographic device would be positioned nearer the opposite end 18 than the muzzle end 19. Thus, the combination of Booth and Tai '362 does not disclose what is claimed because the combination does not disclose a holographic sight device mounted closer to the muzzle end of the barrel than the opposite end.

Tai '362 is typical of the gun-sight art, because the gun-sight art teaches a singular practice of mounting holographic sights away from the muzzle end of a barrel, and not closer to the muzzle end as is claimed. The non-patent literature references cited in the Final Office Action illustrate this point. *See*, Appendix B. In reference (U) (opticsplanet.com advertisement for Bushnell HOLOsight), there is shown a "HOLOsight on a gun" (page 1) where the holographic sight is mounted at the end of the barrel opposite the muzzle end. Also, a "HOLOsight on a rifle" (page 1) is shown where the holographic sight is mounted near the opening for ejecting spent cartridges, <u>not</u> closer to the muzzle end of the barrel. Moreover, at page 3, the reference offers advice in the form of a question and answer about mounting the sight on a firearm, and specific instructions are given that would lead one of ordinary skill in the art to understand that the HOLOsight is supposed to be mounted in the conventional way, i.e., not closer to the muzzle end of

the barrel than the opposite end:

> Q: What type of mounting system do I use?
> A: The HOLOsight is designed to fit on any Weaver-style rail mount. The unit is designed to clamp onto the rail and no traditional mounting rings are needed.

Also, reference (W) (NDIA/EOTech presentation) teaches the conventional mounting arrangement where the holographic sight is mounted on the receiver of an M16 style rifle, and not closer to the muzzle end of the barrel than the opposite end. (*See*, "HWS used in Different Configurations" slide).

In sum, the prior gun-sight art (including the cited references) teaches away from the claimed invention.

In the Final Office Action, the Examiner has taken the position that the "placement of the holographic sight on the barrel and the distance of the sight from the user's eye is independent of the sight's ability to work as intended and is merely related to individual preference." Appellant disagrees that the position of the holographic sight device on a firearm is simply a matter of individual preference. Practitioners in the gun-sight arts reject this position, and this is evident from the singular practice of mounting the holographic sight near the shooter's eye, which is away from the muzzle end of the barrel. The position of the Examiner is further undercut by the teachings of the subject application – "mounting a holographic sight at a muzzle end of a barrel of a firearm facilitates shooting." Page 1, ¶ 0002. Appellant continues to assert that a surprising result of the claimed invention is that a shooter gains increased aiming accuracy with the claimed arrangement over prior art forms because there is a decrease in the angular field of vision between the holographic virtual reticle and the shooter. Placing the holographic sight device away from a shooter's eyes improves alignment with a target for all individuals, and therefore it is not true that the placement of the holographic sight device is merely a matter of individual preference.

Turning again to the Final Office Action, Appellant would like to address the portion of the rejection that begins near the bottom of page 3 and continues to paragraph 5. The Examiner asserts that "The [a) statements of intended use or field of use, b) 'adapted to' or 'adapted for' clauses, c) 'wherein' clauses, or d) 'whereby'] clauses are essentially

method limitations or statements of intended or desired use." However, that statement has no relevance to the rejected claims. Claim 60 explicitly recites that the "holographic sight [is] mounted closer to said muzzle end than to said opposite end", and this is not a statement of intended or desired use. Rather, the claim recites a structural limitation – the sight is mounted on a specified portion of the firearm. Claim 56, in turn, recites where exactly the sight is mounted: "said holographic sight is mounted at said muzzle end."

b. Rejection of claims 49-55, 58 and 59 under 35 U.S.C. § 103(a)

Appellant maintains that independent claim 60 is patentable over the cited references, and as a result, all claims depending from claim 60 are also patentable. However, at least some of the dependant claims 49-55, 58 and 59 are not rendered obvious in view of the cited references, and are allowable on their own merit.

For example, in rejecting claim 49, the Examiner has taken the position that Sanders teaches the specific mounting means ("removably mounting means") by which the holographic sight is mounted on the firearm of claim 60. The subject application teaches that the firearm has a groove (element 5 in Fig. 1, or element 23 in Fig. 4), and the holographic sight device is attached to a strip (element 8 in Fig. 1, or element 29 in Fig. 4). The holographic sight device (element 6 in Fig. 1, or element 33 in Figs. 3 and 4) is mounted on the firearm by inserting the strip into the groove, and pushing the strip in the groove toward the muzzle end of the barrel. The groove ends at an abutment that stops the movement of the strip toward the muzzle end. Fig. 4 shows the attachment strip 22 that is attached to the side of a pistol. Attachment strip 22 includes a dovetail groove 23 that ends at abutment 26. Strip 29 is attached to a holographic sight 33 through support 30. To mount the holographic sight device on the pistol, attachment strip 22 is attached to the pistol (as shown in Fig. 3), and strip 29 is guided into dovetail groove 23 and is moved toward the muzzle end of the barrel 19 until the leading edge of strip 29 reaches abutment 26. Abutment 26 prevents the strip 29 from moving any further toward the muzzle end of the barrel. The strip 29 may be held in place with respect to the attachment strip 22 by a screw 34.

Contrary to the Examiner's bare assertion, Sanders does not teach a removably mounting means comprising a groove, formed on the firearm, and a strip, fixed to a sight

device and having a shape so as to be received and guided in the groove on the firearm. Instead, Sanders teaches something different: A mounting device 160 having a groove 184, and a sight ramp 162 projecting at an incline from the firearm and having a shape so as to receive and guide the mounting device. Moreover, the barrel of the firearm in Sanders does not have an abutment that is arranged and disposed such that when the strip (fixed to the sight device) is received in the groove and is submitted to a force along a longitudinal direction extending from the muzzle end to the opposite end, the strip is blocked from movement in the longitudinal direction toward the muzzle end, but is free to move in a direction toward the opposite end. The barrel of the firearm in Sanders is not an abutment.

Moreover, claim 49 recites a longitudinal direction extending from the muzzle end to the opposite end. The groove direction in Sanders is not parallel to this longitudinal direction. Rather, when the mounting device 160 is installed on the sight ramp 162, the groove direction (groove 184 being on the mounting device 160 and not the firearm) is parallel to the inclined sight ramp 162. Sight ramp 162 is at an angle with respect to a longitudinal direction extending from the muzzle end of a barrel to the opposite end.

And, contrary to the bare assertion, Sanders does not teach that the ramp is provided near or at the muzzle end. Since Sanders was designed with conventional gun-sight applications in mind (see column 2, lines 37-49), one of ordinary skill in the art would not understand Sanders as teaching placing the groove to receive the strip (which is fixed to a sight device) at the muzzle end of the barrel.

Claim 54 recites a barrel comprising a longitudinal rib on top of the barrel. But element 162 of Sanders is not a rib. Rather, element 162 is a sight ramp projection that projects at an incline from the barrel over only a small interval. The present application teaches an over and under shotgun arrangement with a rib 3 extending along the top of the upper barrel 1, and this feature is nothing like the sight ramp 162 in Sanders.

In addition, like Sanders, Tai '060 does not teach a firearm having groove and a sight device with an attached strip that is received in the groove. Fig. 16 of Tai '060 illustrates that base 26 has a groove that slides over Weaver style dovetail rail 105 (see also column 7, lines 21-44).

c. Affirmation of all rejections in Advisory Action

Appellant maintains the patentability of the invention over the cited references, as discussed above in sections VII(a) and VII(b).

VIII. Claims Appendix

An appendix containing a copy of the claims involved in the appeal is attached as Appendix A.

IX. Evidence Appendix

An appendix containing a copy of the non-patent literature references listed on the Notice of References Cited mailed with the Final Office Action (9/11/07) and discussed in footnote 2 of this Appeal Brief is attached as Appendix B.

X. Related Proceedings Appendix

Not applicable.

Respectfully submitted,

Edward G. Greive, Reg. No. 24,726
Renner, Kenner, Greive, Bobak, Taylor & Weber
First National Tower - Fourth Floor
Akron, Ohio 44308-1456
Telephone: (330) 376-1242
Facsimile: (330) 376-9646
Attorney for Applicant

November 25, 2008

Appendix A

1-48. (Canceled).

49. The firearm of claim 60, wherein said holographic sight device is removably mounted on said firearm by means of removably mounting means, said removably mounting means comprising a groove, formed on said firearm, extending along a groove direction from a proximal end to a distal end and open at said proximal end, and a strip, fixed to said sight device and having a shape so as to be received and guided in said groove along said groove direction, wherein the firearm comprises an abutment that is arranged and disposed such that when said strip is received in said groove and is submitted to a force along a longitudinal direction extending from said muzzle end to the opposite end, said strip is blocked in the longitudinal direction towards said muzzle end, but is free to move in a direction toward said opposite end.

50. The firearm of claim 49, wherein said groove is a dovetail groove and said strip has a dovetail shape.

51. The firearm of claim 49, wherein said groove direction is essentially parallel to said longitudinal direction.

52. The firearm of claim 49, wherein said removable mounting means comprises an intermediary arc shaped plate extending from said strip and fixed to said sight device.

53. The firearm of claim 52, wherein said barrel has an upper side and a lower side as defined in the vertical direction when said firearm is used to shoot in a horizontal direction, and said intermediary arc shaped plate is structured so that it supports said sight device so that said sight device is on top of said barrel.

54. The firearm of claim 53, wherein said barrel comprises a longitudinal rib on top of said barrel and said mounting means are structured so that an end part of said intermediary plate comes flush with said rib and said sight device being fixated to said end part.

55. The firearm of claim 49, wherein said abutment is provided at said distal end of said groove.

56. The firearm of claim 60, wherein said holographic sight device is mounted at said muzzle end.

57. (Canceled).

58. The firearm of claim 49, wherein said firearm has an upper side, a lower side and at least one lateral side, as defined in the vertical direction when said firearm is used to shoot in a horizontal direction, and said groove is provided on said at least one lateral side of said rifle.

59. The firearm of claim 49, wherein said groove is provided near or at said muzzle end.

60. A firearm comprising at least one barrel having a muzzle end and an opposite end and a holographic sight device mounted on said firearm, said holographic sight device being mounted closer to said muzzle end than to said opposite end.

Appendix B

Copies of the non-patent literature references listed on the Notice of References Cited mailed with the Final Office Action and discussed in footnote 2 of this Appeal Brief are attached.

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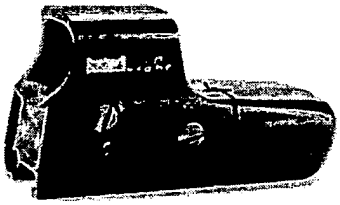

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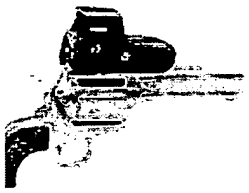

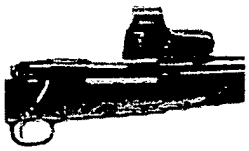

Features of Bushnell HOLOsight Holographic Standard Reticle Laser Handgun Sight 510021:

- 20 Levels of Brightness Adjustment

Features	Benefit
Instant Target Acquisition	Faster shooting
Unobstructed Field of View	Much faster target acquisition
Eye Relief (1/2"-10 Ft.)	Much faster target acquisition
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No Light Cast on Target	Legal to hunt with where red dot sights are legal
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Battery Auto Cut-Off	Shuts off automatically after 8 hours

Specifications for Bushnell HOLOsight Holographic Standard Reticle Laser Handgun Sight 510021:

OPTICS/RETICLE	Holographic Standard Reticle
MAGNIFICATION @100yds	1x
FIELD OF VIEW ft@100yds	Unlimited
WEIGHT (oz/g)	6.4/181
LENGTH (in/mm)	4.125/105
EYE RELIEF (in/mm)	1/2"-10ft/13-3,045mm
BATTERIES	2 type N 1.5 Volt
CLICK VALUE in@100yds/mm@100m	.5/14
GREAT FOR	Shotguns (Deer & Turkeys), Muzzleloader, Handguns, Small Game, Shotguns (Wing Shooting)

Bushnell HOLOsight FAQs:

Answers To Your Commonly Asked Questions About Bushnell HOLOsight

Q.What type of battery does it use?

A. Type N, available at any place that sells camera film.

Q. Can I order a hood for the unit?

A. No. The HOLOsight is so strong that it does not need a hood. The little bit of extra protection it offered was not worth the consumer cost.

Q. What type of mounting system do I use?

A. The HOLOsight is designed to fit on any Weaver-style rail mount. The unit is designed to clamp onto the rail and no traditional mounting rings are needed.

Q. How far does the reticle appear in front of the unit?

A. About 50 yards.

Q. How long does the unit stay on?

A. The battery life is about 70 hours on the initial setting and battery life increases significantly as the brightness intensity is turned down. Keep in mind, however, that the Bushnell HOLOsight is designed to turn itself off 8 hours after the last button was touched. These means that if it you accidentally put the sight in your case without turning it off, it will still work next weekend.

Q. Can it be boresighted?

A. Yes. On a **BUSHNELL boresighter**, use the big crosshairs that are visible to the naked eye as the reference.

Please make sure to select correct model of the scope protector for your **Bushnell Holosight** model! For the **51-0021 Bushnell Holosight** (**N battery Holo sight version**), use the **EOTECH-511 protector**. **http://www.opticsplanet.net/eotech-holographic-sight-protector.htmlBushnell Holosight 52-0021 (AA battery)**, use **EOTECH-552** version of this **Devtron Scope Coat protector**!

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Usability	**4.75** out of **5.0**
Features	**4.50** out of **5.0**
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Meets expectations	**4.75** out of **5.0**

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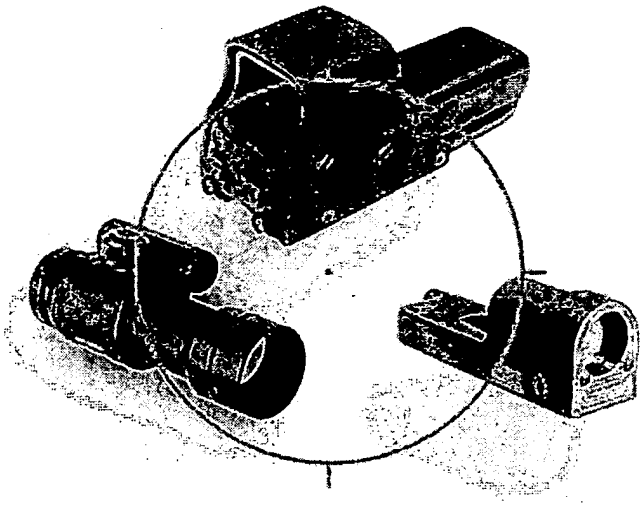


Electronic Sights;

A look at why they exist, how they work, and how you use them.

Photos with model: Oleg Volk

For this article, we define electronic sights as anything within the three general categories; reflex sights, holographic sights, and laser sights. Some refer to them as "tactical sights" but a high power, mil dot telescope could be "tactical" just as well. One UltiMAK user from down south refers to them as "high speed, low drag gringo s#%t". I suppose that works, but it's non specific. Other types of targeting devices are certainly "electronic" but they are not discussed here. There are reflex sights that do not use electricity, and so are not strictly "electronic" but they are included here.

For convenience, the different sections are accessible directly;

Application

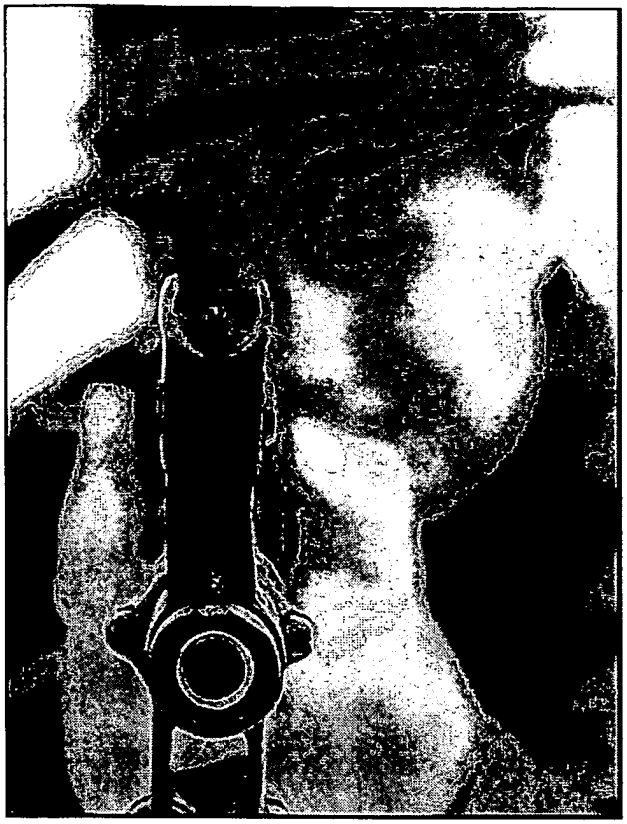
The history of "red dot" sights goes back many decades. They were originally developed for the American sporting market. American special forces units then began buying them in the civilian market for use in low-light raids, allowing them to increase their shooting effectiveness by orders of magnitude, saving many lives. So it has been with many technologies that are now used extensively by our military (Second Amendment supporters take note - does "...the security of a Free State.." ring a bell?). Development for profit in the free market occurs at zero cost to the taxpayer and often in advance of any perceived need.

Anytime you would use iron sights, and at the same distances, you can use electronic sights. The electronic sights will be a lot faster on target, easier to use in a wider range of lighting conditions, and you'll keep your natural view of the target and its surroundings in the process. They are for high speed, at close to medium range, and are particularly superior for engaging a moving target. This makes them equally desirable for self defense, military, hunting, plinking, competition, and law enforcement.

While electronic sights are often called "red dot sights" the aiming reticle is not always red, and it's not always a simple dot. Most electronic sights have no optical magnification, but there are some 2x versions now offered. At least two companies-- Aimpoint and EOTech, now produce a 3x and 4x magnifier, which is a separate optic with no reticle, designed to mount behind your 1x sight and convert it for use as a medium to long range sight. It offers quick conversion from 1x to 3x without any need to remove or adjust the zeroed portion of your aiming system.

Purpose and Benefits

With iron sights, you have to align your aiming eye perfectly with the sight axis. The eye, the rear iron sight, the front iron sight and the target must all be exactly aligned. Your aiming eye is focused on the front sight, not on the target, and the other eye is typically closed. This technique works very well, but it takes a lot of practice, it tends to fall apart under stress when it's needed most, and it limits your view of the target and the surroundings.



Using a telescopic sight can be a big improvement, but still your eye must be exactly in line with the center of the sight tube, and at the correct distance (eye relief) or you get no sight picture-- an issue that gets more critical with increased magnification. Getting on target can take a significant amount of time. This problem is less severe when using Intermediate Eye Relief (I.E.R.) or Extended Eye Relief (E.E.R.) scopes. Telescopic sights do solve the issue of focus-- the aiming reticle will appear on the same focal plane as the target, so both are in focus at the same time. With magnification however, you're typically aiming with one eye closed, which can reduce your awareness of the surroundings, while the field of view through the scope is limited.

With either a reflex sight or a holosight you do not need to have your eye aligned with the sight tube, or sight axis, and eye relief is no longer an issue. You can be looking through the sight from a position that would be useless for iron sights, or for a telescope, and still you can use the aiming reticle successfully. The shooter no longer needs to focus with one eye on a front sight while the

target appears out of focus. As with a telescope, the aiming reticle and the target field will appear on the same focal plane. Unlike a telescope, electronic sights allow the shooter to pay full attention to the target area using both eyes, while the aiming reticle is suspended within the full, natural field of view. For these reasons (reticle in focus with the target, no need for perfect eye-to-weapon alignment, and retention of full field of view) electronic sights are faster on target and are often said to allow for improved "situational awareness".

Additionally, the iron sights, being typically black, can become virtually invisible in low light or when aiming into a dark area or a black target. The aiming reticle in a telescopic sight can suffer the same pitfall. Some telescope manufacturers have addressed this with illuminated reticles. There are iron sights that have tritium powered beta lamp inserts, and others that employ a fiber optic insert in the front sight post. In a reflex sight or holosight, the reticle consists of a bright colored, glowing dot or triangle, etc., so by its nature it is easily seen in a wider range of lighting conditions. If you can see a target, you can use an electronic sight to take aim.

Reflex Sights

Most "red dot" type sights fall into this category. The term "reflex" refers to the fact that the aiming reticle (the dot, triangle, chevron, circle, etc.) is projected forward, from a point behind the objective lens, and is then reflected off the back of the objective lens assembly toward the shooter's eye. The objective lens is therefore a partial mirror, which also means that it will not allow as much light to pass through it as would a regular lens, such as you would find in a regular telescope. In a quality reflex sight this is hardly noticeable, because the reflective lens coating will have been carefully tuned to reflect only the wavelength of light emitted by the reticle illumination system (usually a light emitting diode). LEDs have a very narrow band output,

and are ideal for this application. Some reflex sights use ambient light gathered by a fiber-optic system, and others are supplemented by a tritium beta lamp unit for reticle illumination in low light conditions. These latter two rely upon a wider band of light wavelengths and the lens coating will be adjusted to reflect this greater bandwidth, so they will tend to alter the color of the light passing through the sight a little more than the diode type sights. All other visible wavelengths will pass through normally, and since the wavelength (color) that is being reflected is such a narrow slice of the visible spectrum, you scarcely notice it's missing when you look through the sight. Since the lens coating reflects exactly the color of the reticle, the reticle is very efficiently reflected back to your eye and is clearly visible against the target field. *A reflex sight contains no laser, and no significant amount of light is emitted forward (toward the target) with this technology.*

Reflex sights can be found in two general configurations; the so-called "head-up" type (where else the shooter's head would be is not clear. The name apparently comes from their vague resemblance of a fighter jet's head-up display). These have just one lens assembly, and the reticle source point will be below and behind the lens ("behind" meaning closer to the shooter and farther from the muzzle). They don't look anything like a "scope". These would include the C-more, Trijicon Reflex, etc.. The other configuration looks more like a "scope" in that it has a tubular body with a lens element at each end. Tube reflex sights can be mounted lower on the firearm, since the reticle projection point, and its power source, are typically mounted off to one side rather than below the optical axis of the sight. On a flat-top M-16 type rifle, where you need plenty of sight height anyway, this is no benefit, but on most anything else, the lower mounting option provided by the tube bodied sight can be a real benefit. Tube type reflex sights include Aimpoint, Trijicon Tripower, Leupold, Tasco, Bushnell, and countless others.

Holographic Sights

Whether it's called a "Holographic Weapon Sight" a "Holographic Diffraction Sight" or a "Holosight" it's basically the same technology. A sighting reticle is superimposed on your view of the target field by way of a laser transmission hologram. Without getting too much into the process, it means that a photograph of the reticle is taken using a very careful application of laser light. Google for "holography" and you'll find detailed information on the subject. The hologram, sandwiched in glass, forms a window through which you view your target. Since there is no reflective coating, a holographic sight will not alter the normal light going through it's sighting window any more than a regular piece of glass, or so it seems to my eyes. There is indeed a laser in a holographic sight. The laser beam is spread out by a lens and shone backward, toward the shooter, from a position in front of the hologram window, creating a reticle image that, according to some literature, appears at a virtual 50 yards in front of you. If so, it would mean that a holographic sight would work much like an aperture sight with a sight radius of 50 yards and an

aperture of about an inch and a half. The reticles, being holograms, could in theory be any shape or configuration, including three dimensional shapes. All the holographic sights we've seen are of the "head up" type, so they cannot mount as low on the weapon as a tube sight. There may be a good reason why a holosight cannot have its laser module mounted on top or to one side, allowing the sight to mount lower on the weapon, but if so, I have not heard a case for it. Since the hologram window consists of a flat glass panel, the problem of glint being noticeable to one's prey will be less of an issue, compared to a conventional optic having a convex objective lens. This would make the holographic sight slightly more stealthy in that regard. We know of one manufacturer of holographic weapon sights-- Electro-Optic Technologies. The sights are found under the names EOTech and Bushnell. They have (or had) a selection of different reticles, but their standard 1 minute dot with 65 minute circle is excellent, most especially when engaging a moving target.

The laser light coming through the hologram is polarized. While most shooters may never need to know this, it can be an issue when using polarized shooting glasses. I have an old version of the Bushnell Holosight, and the polarity of its hologram is such that it is greatly attenuated when viewed through polarizing glasses. I suspected that all polarizing glasses, intended for cutting glare when worn outside, under the sun, would be built with the same polar orientation. I made some calls to an optometrist, who did some checking for me and was able to confirm this. There is a more or less ideal compromise orientation to the polarizing filters that make up the lenses in your polaroid glasses, so all manufacturers use approximately the same orientation. I called the good folks at EOTech, and they were aware of this. All Holosights and military Holographic Weapon Sights (HWS) made today have the hologram's polarity at an angle that makes for uninhibited viewing of the reticle when wearing polarizing glasses. This is good news. You can now enjoy the benefits of wearing polarizing glasses in the field, and still use your holosight to full effect.

In the field, a reflex sight and a holographic sight are used exactly the same way and for the same reasons. They are completely different technologies used for solving the same problems. Neither one of them is a "laser sight".

Laser Sights

A laser sight is merely a laser pointer designed to tolerate firearm recoil, and having windage and elevation adjustments for zeroing the laser with the weapon. The laser light needs to make the round trip from the weapon, to the target, and back, and still be visible to the shooter. The visibility of the laser dot is therefore affected by distance, tremendously affected by the reflectivity of the target, by the brightness of the daylight, and by atmospheric conditions like fog, rain, snow, dust and smoke. A laser sight therefore needs a lot of power compared to a reflex sight or holosight. Unfortunately, the government has chosen to limit the power of lasers available to us peons, presumably

because we are incompetent, and present a danger to ourselves and others.. Lasers also cannot be seen at all in clear air unless they are actually falling upon an object (imagine your scope's cross-hairs being invisible until you're right on the target). This is usually not a problem indoors, but outside it can be debilitating (think trap shooting, or think about a target that is against nothing but sky, or against a very distant background). No dot at all can be seen in that case unless the laser is shining directly on the target. You can see the beam in fog, etc., in which case the beam points the way directly to the firearm, like a lighthouse beacon. One benefit to a laser is that it can be used to point out objects to people other than the shooter, since its dot falling on the object can be seen by anyone. The dot, if it's the right wavelength and power, can also be detected by the guidance system on a laser guided missile or bomb. In military applications, these "laser designators" can be weapon mounted, so as to serve the purpose of guiding ordinance into a target, or for pointing out a target to the crew of a gunship, etc., and can also be used to aim the firearm. Infrared lasers make for a stealthy laser sight or designator when used with night vision devices. Lasers do not require the weapon to be shouldered, or brought into the shooter's line of sight, in order to be useful for aiming the weapon.

We hear tales from the sand box that visible lasers, whether zeroed to the weapon or not, make for an effective crowd control device. Once a trouble maker notices the bright red dot on his chest, he "gets polite real fast". This is an application I had not considered, and I would say it's a very specialized application. Still, it could be better than having to actually shoot someone just to get their attention.

I can see a use for lasers in casual plinking too, or for Boomershoot, wherein a spotter could use a laser to point out targets to the shooter or vise versa. This could become a real problem though if a lot of people at one event are using this technique-- who's going to know whose laser dot is whose? Same goes for a law enforcement situation where several officers may be painting laser dots at the same time (is that my dot or is it my buddy's dot? What if I pull the trigger and realize later that I was looking at someone else's dot?) The thing to remember is that a laser, unlike all other sighting devices, is an active sensing device. It is not private.

A holographic sight is not a laser sight, in that it does not project a laser beam onto the target, and does not suffer from the above quirks. Rather, it uses a wash of laser light, shone toward the shooter, to display a hologram.

A reflex sight is not a laser sight either. It provides a red aiming dot, similar in appearance to a laser dot, but it has no laser. It puts the dot (or other type of reticle) backward, into your eye.

How Far Does it Go?

When discussing reflex and holographic sights, we are often asked, "How far

does it go?" The answer to this question is "Just a few inches". The person asking the question is thinking about a laser sight, when we're having a discussion about a reflex sight. The reflex sight's reticle image travels from the sight body back toward your eye. Unlike a laser, you can point the sight at the open sky or at the moon and see the reticle just as well. You can use reflex sights just as easily at the weapon's maximum range as you can at 5 feet.

A laser sight is limited in its useful range by atmospheric and lighting conditions. In ideal conditions (twilight with a highly reflective target) a laser will be useful at many times the distance you could use it in bright sunlight with a light absorbing target. I've had a very hard time using a laser at 7 yards in direct sunlight, and I once used a laser at about 200 yards with no trouble because the target was in shadow at dusk. Quality reflex sights and holographic sights have no such limitations.

Field of View

Field of view refers to the angle, or the width, or the angular size, of the image viewable through the sight (30 feet at 100 yards, for example, etc.). Field of view is an important issue when using the more familiar telescopic sight-- You want a wide field of view so you can find the target, see what's going on around the target, or in some cases to be able to see the whole target rather than a small portion of it. For this reason, manufacturers have been publishing F.O.V. specifications for their telescopes for years. Field of view specs matter very little if at all when using 1x electronic sights. Certainly, field of view is always important, especially in close quarters battle, in hunting, or in IPSC competition. However, a 1x sight is designed for use with both eyes open. Your field of view is therefore not limited by the sight, but only by the design and condition of your eyeballs. Field of view, per se, through a 1x sight therefore hardly matters.

All the electronic sight is doing is providing a reticle, superimposed on your natural field of view.

What matters to us when using electronic sights is what I will call Maximum Off Axis Displacement (MOAD) defined as the maximum distance from the center axis of the sighting window (right, left, up or down) at which the eye can acquire and use the reticle. It could simply be termed Effective Viewing Area (EVA). The M.O.A.D. may be loosely related to field of view, but when sighting with both eyes open F.O.V. does not correctly identify the issue.

(This is not to be confused with eye relief, which is the required distance between the sight's ocular lens and the eye. 1x electronic sights have unlimited eye relief, so they can be mounted at any point along the weapon.)

If the sight is too close to you, there will be a small blind spot where the body of the optic blocks the view of both eyes at once. The unlimited eye relief of

these sights allows mounting the optic forward of the receiver, farther from the eye. At UltiMAK we design our rifle optic mounts to take advantage of this unlimited eye relief, putting the optic forward of the receiver where it eliminates the blind spot, and down low, closer to the iron sight axis where your rifle's comb was designed to place your aiming eye. Achieving these goals requires overcoming more design challenges, better engineering and more sophisticated manufacturing processes, but the payoffs in ergonomics (in a better "fit" to the shooter) are more than worth it.

Occlusion

Often, I hear people talking about a dot, or large triangle reticle "covering" too much of the target. This is a nonsensical issue. First, there is significant occlusion resulting from the front and rear iron sights, and I've never heard a complaint about that. Second, aiming with both eyes open, there is no occlusion of any portion of your naked-eye field of view. Your big triangle reticle may "cover" part of the world for your right eye, but your left eye is free to see it. Whatever may be obscured from one eye will be visible to the other. As long as you have two working eyes there is no such thing as occlusion when using an electronic sight, except when you want it (see below).

Washout

This may be a real issue in some cases, but it needn't. Washout occurs when aiming into a bright area, causing the reticle to become lost in the glare. A very bright reticle setting, as found in a high quality sight, is one solution to this problem. There are at least two others;
1. Close your front lens cover. Now you cannot see through the sight at all--field of view = 0 Degrees (zero feet at 100 yards). With the front lens cover closed on a reflex sight, your aiming eye sees the glowing reticle against a black background, no matter what. Your other eye sees a largely unobstructed view of the world. Your brain can blend the two images, and assuming you have two useable eyes, you will see your aiming reticle against the target field under any lighting conditions. Enter the Occluded Eye Gunsight (O.E.G.). Close the front cover of your Aimpoint, for instance, and you have, effectively, an O.E.G..
2. Install a polarizing filter on your reflex sight. I'm not sure of their thinking behind them, but several optics manufacturers have come up with dual polarizer attachments that can be (tediously) adjusted so they cross, blocking out most of the incoming light. This is an Attenuated Eye Gunsight (A.E.G.?) or Mostly Occluded Eye Gunsight (M.O.E.G.?) and it will serve the same purpose as the closed lens cover. You can also rotate the two polarizers to where they are aligned, providing a view in polarized light. The latter can be very effective in cutting glare if you align the two filters at the necessary angle (if you're using polarizing glasses, this would already be addressed, and

placing a polarizer on your sight will then possibly turn down the light).

In theory, this could be done with a holographic sight by placing a filter or cover forward of the laser window. It would reduce or block light coming from the target area, and allow the laser light to pass through unobstructed, giving you an Occluded Eye Holosight (OEH?). As far as I know, the holo manufacturers have not addressed this. The high intensity reticle settings tend to do the job pretty well though.

Co witnessing

It's often difficult to grasp the true simplicity of a new concept, so we make it complicated as a way of justifying our misunderstanding. So it is sometimes with co witnessing. The term means only one thing-- The ability to use either the optical sight or the iron sights, by changing almost nothing other than your attention. You are able to use the iron sights by looking through the lower portion of the electronic sight's viewing area. It does not mean that the iron sights and electronic reticle are used at the same time. Co witnessing simply gives you a redundant sighting system in case one of them fails, or you forget to switch on the electronic sight.

We occasionally have people tell us things like, "I finally got my dot to co witness about a quarter inch above the iron sights..." Again-- Nonsensical. If your electronic sight is zeroed for the same distance and wind as your iron sights, and you line up your iron sights while your electronic sight is turned on, you will see the electronic reticle aligned with the top of the front iron sight post. When using the electronic sight, you would typically look just over the top of the iron sights, such that the electronic sighting reticle appears to float above the iron sights. Again, the apparent position of the electronic reticle within the sighting window is of no consequence and it depends on the position of your eye. Once zeroed, the reflex dot can be at the very bottom, the extreme left, right, or top of the viewing area and it still represents your proper aiming point.

Zeroing

Electronic sights of all types are zeroed with the same technique used for a regular scope. They have separate windage and elevation adjustments, calibrated in minutes of angle (MOA). One difference is that you usually don't have the typical cross-hairs to use as a visual guide for leveling the sight on the firearm. Leveling of a dot sight is done by eyeballing the exterior of the sight so the windage and elevation caps are square with the firearm (or more importantly, level and square with gravity as you hold the weapon in a shooting position). Unlike a tubular sight, a holosight, or other "head up" type sight has a fixed orientation on the mounting rail. The zeroing process itself is the same as with any scope. One exception is that with co witnessing,

assuming the iron sights are zeroed, you can come very close to a "zero-shot zero" simply by sighting down the irons and adjusting the dot to align with them, representing your point of impact. Always confirm zero on paper at the desired distance for your irons and your electronic sight separately before trusting them.

There are some tube reflex sights (Aimpoint for one) that can be mounted with the switch module on either the left or the right side. This has resulted in confusion for some, because one adjustment will be marked "UP-R" and the other is marked "UP-L". If the adjustment happens to be on top, it moves your point of impact "UP" when turned in the direction of the arrow. If it happens to be situated on one side or the other, it moves your bullet impact point either "L" or "R" as marked. Simple enough.

I submit that since most military rifles' iron sights have Bullet Drop Compensated (BDC) settings, some calibrated out to 1,000 meters, it stands to reason that an enterprising optics manufacturer could show strong precedent for a BDC electronic sight. After zeroing at the prescribed distance, you crank the elevation knob to the appropriate range setting and aim dead on, just like you would with iron sights. The adjustments could be mechanical or electronic. A transparent LCD reticle display for instance, could be controlled by a simple computer, programmed for the trajectory of any load. For a 1x or 2x sight, a "screen resolution" of 1 MOA is generally going to suffice. Aimpoint has taken a step in this direction, producing a mechanical, externally adjustable mount with three quick-select range settings, designed for their MPS II reflex sight. BDC presets are practical for the military because they use standardized loads fired from standardized barrels. For us civies, who use a mind boggling variety of loads from an infinite continuum of barrels, an adjustable preset system would be suggested. The concept of an externally adjusted optic is certainly nothing new. Maybe it's time to take a few closer looks at it, but with electronic sights in mind.

Update: We hear from our super-secret inside sources that a prominent optics company is working on a BDC reticle for their current line of military-grade 1x electronic optics. It will have multiple aiming points, each calibrated for a separate distance, based on a common military cartridge/weapon system's trajectory. Hopefully it will have a built-in bubble, because if you're lobbing rounds out to 600 or so, cant will become an issue.

Update #2: EOTech, a division of L3 Communications, is now producing their new BDC holographic rifle sight reticle. It is built in three variations at this time: One for the M4 Carbine (5.56 NATO) one for the M240 and other 7.62 NATO (.308 Win) setups, and another for the M2 machinegun (50 BMG). They also now have a magnifier that can be mounted behind the sights, allowing instant conversion from 1x to either 3x or 4x (depending on model) and back again using QD mounts. Look for these new products soon here at UltiMAK.

Anecdotes on the subject of reliability

We at UltiMAK bought our first Aimpoint, the old model CompML, about four years ago as of this writing. It has been used in practically every test firing/product torture session since, and has logged well over 7,000 rounds in all weather, from boiling hot on a smoking AK barrel to sub zero. More than once it has been taken to a trade show and left on all day. It still has the original battery and is going strong. The more recent Aimpoint models have a new diode that uses a fraction of the current our old sight uses, so the battery in the new models lasts approximately 30 times longer. If the battery is replaced, as a precaution, every two or three years, the average recreational shooter will never experience a battery failure unless the sight is left on for weeks, months, or in the case of the new Aimpoints, years at a time while it's in storage.

The Trijicon Reflex, Reflex II, and the new Tripower can be used for a lifetime without batteries. They have a 12-year tritium beta energy source, providing constant-on reticle illumination for low light conditions. After 12 years, the tritium illumination unit, or beta lamp, can be replenished at the factory. For daylight, they have a fiber-optic system that gathers ambient light and pipes it in to light the reticle. The Tripower has a diode that can be powered with a battery, but its battery supply is only there as a supplement to the fiber-optic illumination system for situations in which a super bright reticle is required (see above under "washout").

We have a military pattern M1 .30 Carbine with UltiMAK mount and an old Bushnell Holosight. Within the first few days of shooting the brand new carbine, the rear iron sight body came loose in its dovetail slot and fell off. The front sight has since shot loose. It may be that iron sights are an "old standby" upon which one can rely when the new, high-tech gizmos fail, but in this case it was the other way around. The Holosight has been transferred from one firearm to another, used in all weather conditions, subject to .308 rifle recoil, and it still works like new.

I own a new Winchester 1894 "Wrangler" .30-30. I had my kids out for a drive in the mountains, when we decided to take out the Winchester and do some plinking. We were missing terribly, only to discover that the rear sight elevation wedge had fallen out inside the case. It's a perfectly good rear sight design, but it got bumped in just the wrong way as it was being put in the case, and the wedge popped out, throwing the elevation off by a mile. **Update;** The Winchester's front sight has now come loose, and caused us to waste more ammo chasing a wandering zero. The rifle has fired a total of no more than about 200 rounds since it was made - not enough to equal one typical day of test shooting at UltiMAK.

Then there is the Mini-14 Ranch model we bought new for testing our M4-B prototype. The Ruger is a truly great work of engineering. The first day at the

range left us crawling on the ground, looking for the rear sight after it had shot loose and fallen off. We had the same experience with a Mini-30. Ruger, to their credit, has since redesigned the rear irons.

I once had a brand new Beretta Tomcat pistol. It was a flawless performer, but it came from the factory with a drift adjustable rear iron sight that was so far to one side the bullets were hitting two feet from point of aim at 20 feet. I was able to use a brass punch to drift it into a reasonable position, but it was not something I could have done at the range.

A new SKS of mine needed a small correction in front sight elevation so the calibration marks on the rear sight would be meaningful. The split screw front sight post, which is a fine design, broke in half due to shock and recoil before I got the chance to move it. Bad heat treat apparently.

Of all the optic sights I've used, I disliked the cheap ones due to poor optical quality and quit using them, so none of them ever got around to failing. Left with the better ones, I've used them for thousands of rounds of testing, target shooting, plinking and hunting, and they have never failed, except one-- a relatively inexpensive telescope mounted on a 10/.22 sitting in the back of my pickup in a soft bag for a year. My kids had stepped on it and the cheap mounting rings were bent.

While optic sights can and do fail, it just happens that my personal experience with the reliability of optics has been far better than with iron sights. Please don't accuse me of claiming that optics are tougher than iron sights. I'm not. I have merely related my personal experiences. Others will not doubt have had different experiences. One thing is certain; Iron sights are not the end-all, fool proof, always-there-as-a-last-resort-no-matter-what aiming system that some might think. Understanding, caring for, and regularly practicing with your gear is the key.

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UltiMAK™

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Send us mail | fax: 208 882 3896 voice: 208 883 4734
2216 South Main, Suite B-2, Moscow, ID 83843

HOLOgraphic Weapon Sight
Product Introduction

NDIA/EOTech presentation

June 2004

NDIA/EOTech discussions

- Agenda:
  - Background on EOTech
  - Technical description of HOLOgraphic Weapon sight
  - Overview of features/functionality
  - "Futures" or Adaptations to Core sight

EOTech's technical roots … from the Environmental Research Institute of Michigan

- Founded in 1946 - Originally part of the University of Michigan
- Nonprofit Research and Development Institute (at peak 600+ engineers)
- Specialties - Image Processing, Remote Sensing, Battlefield Surveillance, & Advanced Optics
- Core Contracts with Intelligence Agencies, NASA, etc …mostly classified programs
- Some Industrial Applications - Collision Avoidance/Medical Imaging/Metrology
- Holography 1st demonstrated at ERIM in 1962

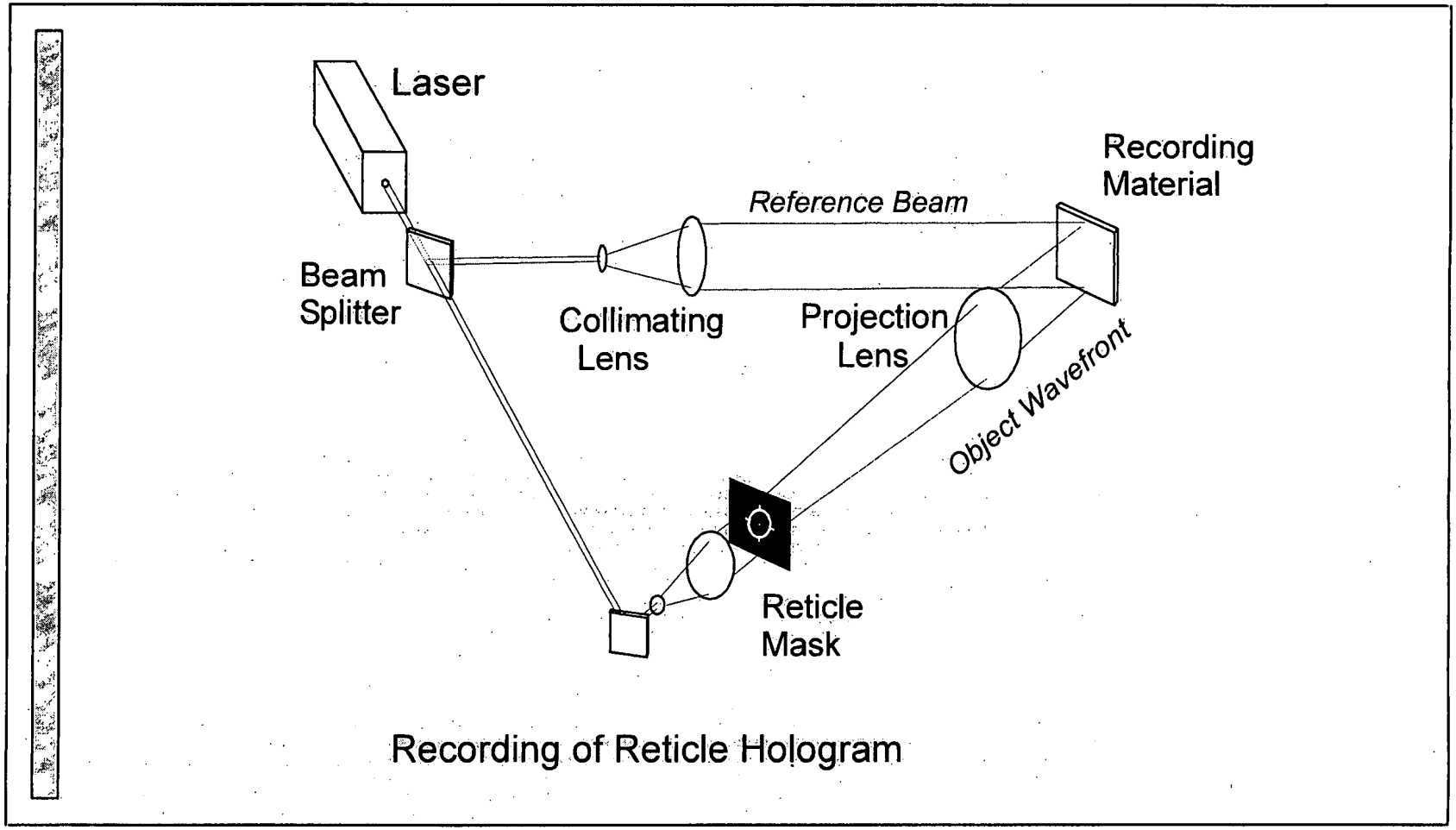
EOTech Summary

- Invented, designed, & manufacture the 1st Holographic based weapon sight
- Patented technology & proprietary manufacturing position
- All technology and manufacturing rights reside with EOTech
  - manufacture all transmission holograms in house (2 per sight)
  - perform assembly, Q/C, qualification & testing in house
- Outsource all sub-components
  - 85% of component cost fabricated in US
  - 40-45% in SE Michigan
- 200,000 sights shipped in 7.5 Yrs of production …
- Large DoD contracts since Dec 03: ARDEC, MARCORSYSCOM, USSOCOM SOPMOD

History of HOLOgraphic Sight Development

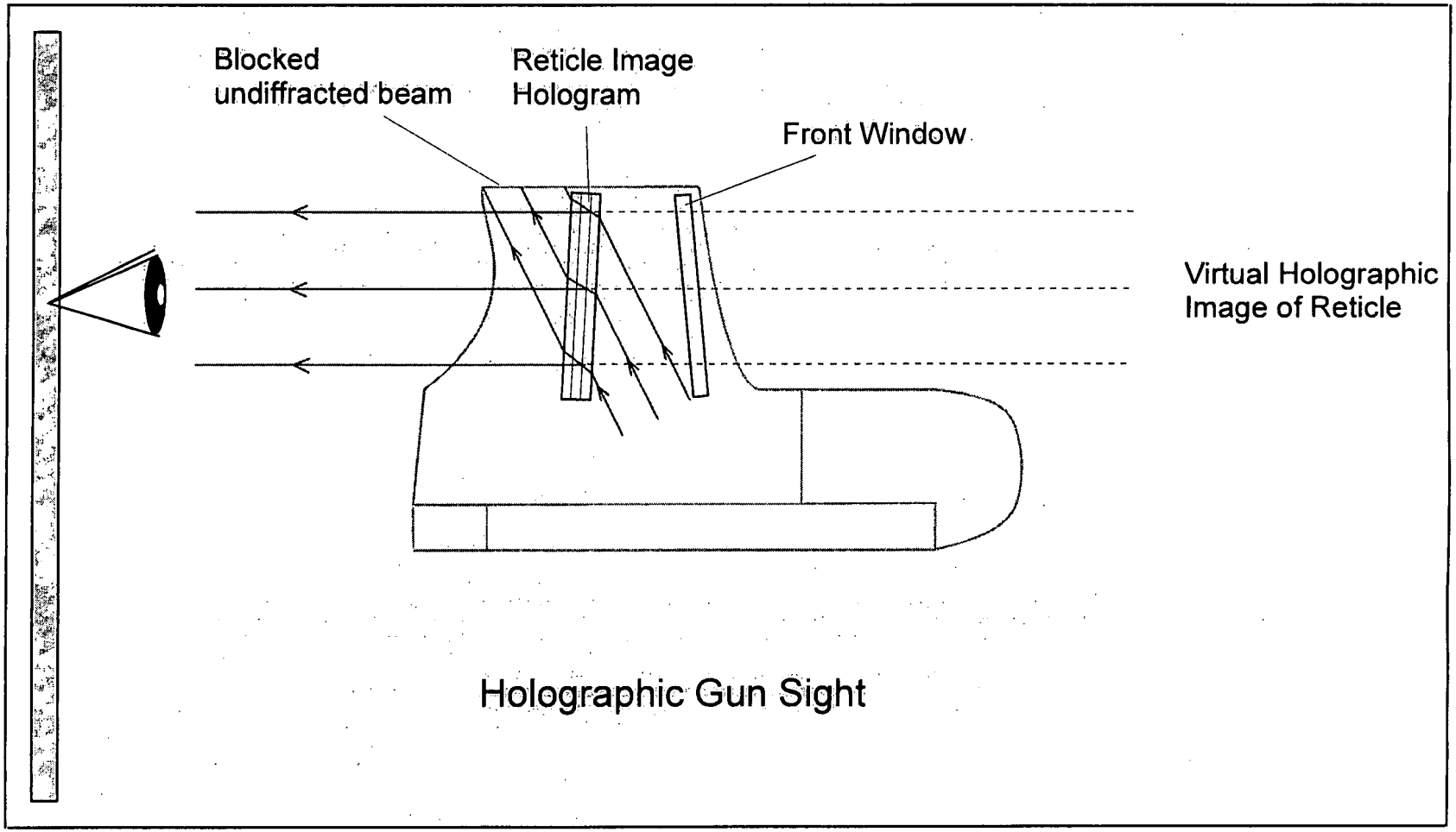
- ERIM invents laser holography in 1962
- Prototype sight completed for US Military in 1971 (ERIM contract)
  - helicopter gunships for Wright Patterson (Air Force R&D) contract
  - anti-aircraft weaponry for Army contract
- In early 1990's … Laser miniaturization and diode cost reduction made the sight "feasible to market"
- In 1996, partnered with Bushnell - released commercial HOLOsight
  - won top awards at SHOT show
  - Generation 1 HOLOsight did not meet requirements for military application
  - Army awarded Aimpoint M68 contract
- Generation 2 HOLOsight released in Jan'00 … for commercial markets
  - based on modular design … built with military upgrade in mind
  - solved NV, AA, weight, length issues, but kept same core optical performance
- Official release of Gen 2 Military grade HWS in '01

Holographic Gun Sight – Basic Concept



Recording of Reticle Hologram

Holographic Gun Sight – Basic Concept
(continued)



EOTech Alliances

- Bushnell is marketing partner for commercial shooting sports sector (since '96)
- ITT relationship secured for tandem operation behind NV monocular
- Diemaco places HWS on C7/C8 weapon … resell only in NATO countries (i.e. Holland, Norway, and Denmark)
- FN Herstal/Armor Holdings/Sage/CTS on their respective Less Lethal Launchers - with ranging/trajectory reticle
- Smaller M16/M4 suppliers (7-8 mfgs) as well as IMI/Singapore Tech as "system integrators"
- General Dynamics on Tri-barrel .50 Electronic Gatling Gun for Helo/Hummer applications; and XM-312 and 307 sighting system
- Informal arrangements with H&K, Litton & Sig … quote as option to their weapon/NV platforms
- Working with Talley Defense & Borfors on light armour launcher with specialized reticle image

HOLOgraphic Sight Product Line

- M550 - a military grade unit with NV compatibility & AA battery option
  - Both versions listed on GSA
- Model 510 – a tactical law enforcement unit without NV (N or AA battery option)
- Model 510 for specialized less lethal launchers
- Model 500 – called Bushnell HOLOsight for resell to commercial firearms market
- Model 520 – archery product sold direct by EOTech thru its commercial channels
- Various weapon mounting platforms to ensure secure positioning on weapon platforms

HWS's #1 Feature - Speed

- Full, large, "see through" reticle images provide quicker eye recognition … easier and faster than a single dot
- Speed advantages over Red Dots are very apparent … especially when users or targets are moving
- A more "forgiving" reticle & sight picture
  - Improper cheek weld, sloppy weapon presentations
  - Awkward shooting position or engaging around physical barriers
- Standard pattern provides no compromise between speed & precision accuracy
  - 65 MOA ring for natural centering
  - 1 MOA Dot -smallest in the industry
- Reticle does not "cover up" target area at 300m+ ranges

Heads Up - Eyes Searching Vision

- Rectangular Heads Up Display - like looking through a windshield (a greater FOV)
- Tubeless design eliminating "blind spots" or constricting view
- Streamline design with no blockage from battery compartments, mounting rings, lens protectors, ...
- True 2 eye open shooting is achieved
- Maintain Use of Peripheral Vision – assists in engaging multiple threats
- Optical Field of View is between 25-50% greater than Red Dots

Other Key HOLOsight Features

- No physical blockage of light source to make Sight inoperable (exposed light source)
- Functional if window covered with mud, snow, sand, water, etc. - ***AND*** - Zero maintained
- "Shatterproof" laminate 3/16" thick - bonding of 3 optical surfaces creating a "hardened" Heads Up Display
- Functional if window is broken/cracked
- Elimination of Muzzle Side Signature
  - No light emitting beams to give up user's position
  - Reflective glare is eliminated due to A/R coated flat surface
  - Non -detectable even with muzzle side NVGs

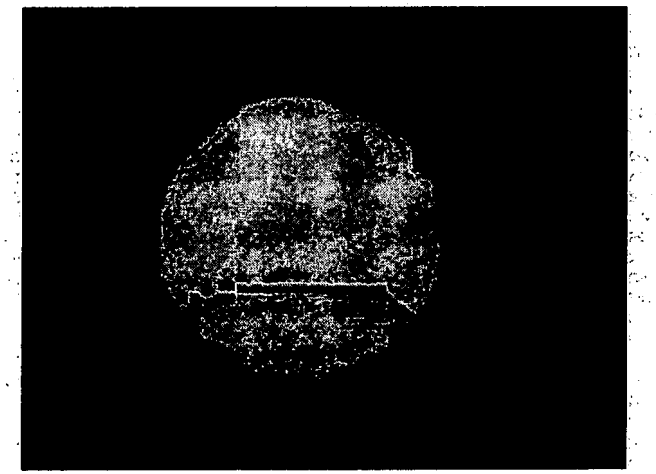
Compatibility with Night Vision

- Works in tandem with Gen I – Gen III+ intensifier tubes
- Tube saturation is eliminated – no "halo" affect of reticle on target scene
- A passive weapon aiming system - no user signature
- Flexibility to witness reticle with either head mounted or weapon mounted NV monocular
- Minimal target obstruction with 1 MOA aiming dot … improved accuracy

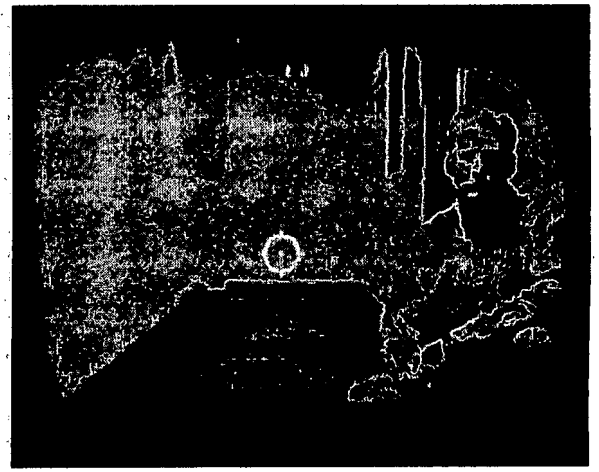
HWS Night Vision specifics

- Instantaneous drop to NV mode – fractions of a second
- 10 settings within NV mode – supports 128:1 brightness contrast ratio
  - Variances in tube sensitivity
  - Ambient light conditions
  - Variances in human eye sensitivity in NV mode
- 30 total settings – 20 for normal day/low light operation (28,000:1 contrast ratio)
- Toggle between NV and normal day operation
- Auto-turn-on for NV mode with setting at NV brightness level 4

Operation with Night Vision Scope



Seen through M-68



Seen through HWS

Additional HWS Capabilities

- Parallax Free optics - eliminates critical eye, sight, target alignment
  - Eliminates multi-plane focusing error
  - Cheek weld is not needed to engage
  - Very simple for soldiers to use .... A point and shoot weapon optic
- Unlimited eye relief - adaptable to various weapon platforms or user preferences
- Common AA battery source – unique among Military Red Dot competitors
- No reticle "wash out" in bright sunlight, white targets, or desert/artic conditions ... Reticle clearly visible in ALL types of lighting conditions
- Tool-less User Interfaces for battery change-out, mounting, W/E adjustments, etc.

Battery options & electronic features

Universally available AA batteries (M552 and M512 only)

- Use Lithiums, Alkaline, or re-chargeable AA
- Adds 1 inch to length – spatial issue on Picatinny rail
- Common battery source and interchangeable to NV, Flashlights, IR pointers, GPS, etc …
- 5X greater battery life with Lithiums
  - At default (Level 4) to 800 hours at 70 F
  - At 7 F to 400 hours – at default setting

- N Alkaline battery option available … used when space is limited (sub guns)
  - available at K-Mart/WalMart at $3/set (camera batteries)
  - Battery Life ranging from 200 hours (default setting 12) to 500 hours (at setting 5) at room temperature
- Auto Battery Check upon start-up with blinking reticle at 20% or less
- Auto shut down at 8/4 hrs

Environmental Parameters

- Operating Temp = -40 to 150 F; Storage to -40F
- Waterproof & Submersible
  - M550 to 33 ft (10m)
  - M510 to 10 ft (3m)
- Fog-proof internal optics
- Scratch Resistant, A/R coated and maintenance free optical surfaces
- Corrosion resistant components
- Hardened/Anodized finish
- Typically used solvents do not affect operation

Durability

- Survives 10 ft drop tests - holds zero to 1-2 MOA
- Tested in various environmental chambers including salt spray, thermal shock, pressure, etc.
- Recoil testing at 3,300 G's/0.5 Msec (.454 Casull) with 100% sampling
- Field tested on heavy resonance weaponry – General Dynamic's Tri Barrel .50 Gatling Gun

Mounting Accessories

- Interfaces to standard Picatinny rail for Flattop configurations … with flip up iron sights (co-witnessing)
- Repeatable to within 1 MOA upon re-mounting
- M-16A1 fixed carrying handle configurations
  - Cantilever mount to achieve co-witnessing
  - Carrying handle mount … access to iron sights or for NV mounting
- For most weapon platforms - no changes to the receiver or user's trained cheek weld position
- 1 thru bolt/clamp … allows user flexibility for placement anywhere along the rail
- Mounting brackets/rings available for ITT PVS 14 and Litton 983 monocular tandem setup

Upgrades and Releases in CY03

- New battery contact design … standard on all military models
- New membrane switch design for M550
  - Much sharper tactical feel … especially with cold weather gloves
  - Larger switches … much easier to operate
  - Separation of NV switch with round inlay … avoid user error
  - Now standard on all military models
- Standardized to 33 ft water immersion depth
- A battery cap tether design is being worked on … no decision to offer yet
- Release of 2 x less lethal reticle images … for Sage and FN Herstal
- In testing for a hydrophobic lens coating to minimize external condensation and raindrop occlusion

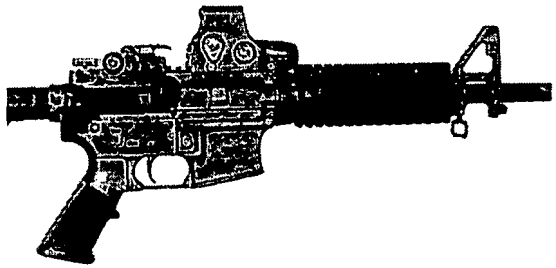
Adding Magnification for Long Range Engagement

- Holographic sight provides true point source as aim point
- Dot size limited only by eye resolution to 1 m.o.a.
- Placing 4X scope behind sight magnifies target scene 4X but dot size remains 1 m.o.a.
- Effective dot size is 0.25 m.o.a. or 1 " at 400 yards
- Aiming dot provided by holographic sight, placement of magnified scope not critical
- Not true with red-dot sight where image of LED is projected
  - If magnified scope is placed behind sight, dot is magnified with target scene – no gain in aiming precision
  - If magnified scope is in front of sight, target scene is shifted relative to aiming dot, re-zeroing is required. Long eye relief also severely restricts FOV

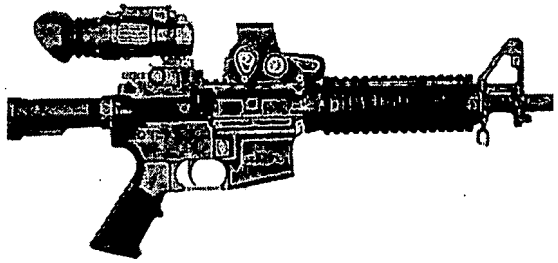
Optical magnific tion for longer range engagement

- CQB/MOUT capability is seriously compromised by operating a variable power 1X-4X scope at 1X as CQB/MOUT optics.
- Better solution is to add 4X magnification to a CQB/MOUT optics to provide long range engagement capability
- The unique feature of a holographic reticle makes such an approach feasible
- Together with a night vision scope, the sighting system meets the needs of DoD ground forces in various mission scenarios

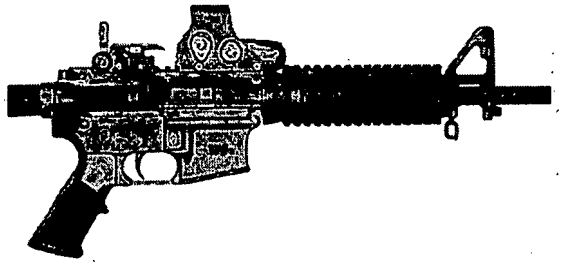
HWS used in Different Configurations



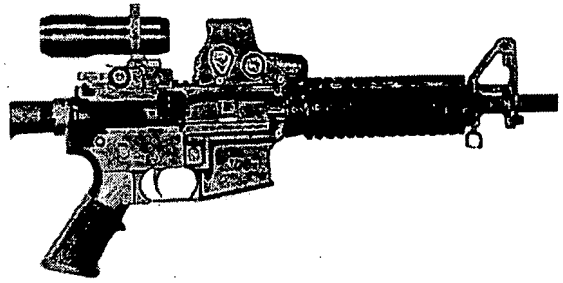
CQB



With Night Vision Scope



With Backup sight



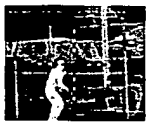
With 4X scope

Summary of HWS Attributes

- Superior Product for a CQB/MOUT weapon sight - optically, user features, enhanced user performance
- Clear performance gain in tandem with NV and magnified systems
- Pricing is comparable to military grade Red Dots
- No change to M-16 style weapons … all mounting/co-witness platforms are in place
- Adaptability to a host of small arms weapon platforms … with no weapon modification
- Flexibility to adapt to crew-served weapons platforms
- Rich technology company with strong electro-optics resources

EOTech Electro-Optics Technologies at TREXPO East

Posted on Friday, October 19 @ 00:44:42 PDT by davidc



The EOTech "HOLOgraphic Diffraction Sight" (HDS) is beyond a doubt the highest-speed, lowest-drag optical sight for tactical shoulder weapons that is currently available. Utilizing the same technology as the Heads-Up Display (HUD) in modern fighter jets, the HDS projects a red holographic circular reticle with center dot directly onto the target. This is very different from standard red dot and reflex sites, which do not use holography.

Click on "Read More" below for the rest of the story.

The holographic reticle will not obscure the target in any way, and is not subject to parallax. Therefore, the HDS is best utilized while keeping both eyes open. As long as the operator is looking through the sight with one eye, the reticle will naturally be projected wherever the weapon is pointed. Now, here's the kicker--according to the company, "in holography, all the information required to reconstruct the reticle image is recorded everywhere in the Heads-Up display window". Even if the window is almost completely obscured, whether it be by mud, snow, rain, etc., the HDS will remain fully operational (with point of aim/impact being maintained), as long as at least some part of the window remains unobstructed--even if it's only one of the corners. Even in such extreme cases where the laminated window is shattered, the HDS, again, will remain fully functional as long as some part of the window is left intact. In practical terms, as long as the operator can see through ANY portion of the window, the ENTIRE reticle pattern will still be visible on the hostile BG that needs to be neutralized.

Eotech's top units are their M551 and 552, which are only available to military and law enforcement. The M552 was specifically developed for the United States Marine Corps. Where the M551 takes N cell batteries, the Marine Corps version, the M552, takes AA batteries (which are cheaper and more available), and only extends the length of the unit by 1.3 inches. Both units are also fully compatible with Generation I - III+ night vision intensifier tubes. They also has a neat feature that allows the operator to immediately drop the brightness intensity of the holographic reticle to eliminate any "halo" affect and saturation of the night vision device. One can position them behind a night vision scope without any "bloom" of the target area. Conservatively the AA version should give the operator roughly 350 hours of operation at default setting "12". Most people do not actually use the site at the "12" setting. Anyware from "8" to "10" is much more common. With minor electronic mods, either version can be made compatible with Gen IV night vision devices.

DefRev looks forward to acquiring one of these units for testing sometime in the very near future. In the meantime, to learn more about EOTech's products, you can visit their website by clicking on this link.

www.knightarmco.com

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ARTICLE

September 2004

Holographic Weapon Sights Grip the U.S. Military Market

by Roxana Tiron

The U.S. Special Operations Command, Army and Marine Corps are buying holographic weapon sights and shipping them in large quantities to soldiers in Iraq and Afghanistan.

The only company that makes the scopes currently has strengthened its hold on the market with multi-million dollar contracts for some 77,000 of the sights.

Eotech Inc., based in Ann Arbor, Mich., touts itself as the company that invented, designed and manufactured the first electro-optic sighting system to apply holographic technology to small and medium-sized weapons.

A hologram is a three-dimensional image formed by the interference of light beams.

The Eotech holographic weapon sight projects an illuminated reticle pattern directly on the target. A reticle is a network of fine threads or lines in the focal plane of a scope to help accurate observation.

However, no forward light is projected from the sight; it is just the appearance of light. The laser technology projects an image onto a hardened piece of glass, just as in heads-up displays in fighter jets and helicopters.

Together with Bushnell—a company known to many for its microscopes and binoculars—Eotech released a commercial version of the holographic sights in 1996. The combat version began trickling into the military at the end of 2001, said Patrick Gallagher, Eotech's government representative.

The company first targeted SOCOM with its technology, said Van Donohue, Eotech's vice president for marketing. In the past two years, the company has sold 5,500 sights to individual special operations units, which bought the technology with their own funds, said Donohue. A sight can cost between $300 and $350, he said.

Meanwhile, the Naval Surface Warfare Center at Crane, Ind., awarded Eotech a $16.6 million contract in May for 66,666 enhanced combat optical sights. This capability provides for lightweight, waterproof optical sighting devices for battle at close quarters, as well as out to 600 meters. The work is expected to be completed by 2009.

Eotech is presenting its holographic sights as an alternative to the "red dot" technology, already battle-tested and popular among U.S. troops. The M68 red dot sights are standard issue.

Red dot technology and the company that develops and markets it, Aimpoint AB of Sweden, are entrenched firmly in the market. The company staked its position when it was awarded the first multi-

U - page 2

year contract for red dot sights by the U.S. Army in 1997.

The Aimpoint red dot sights are non-magnifying sights with unlimited eye relief, allowing fast target acquisition which speeds recovery in situations where follow-up shots may be necessary, according to the company. Aimpoint sights allow shooters to work in any light condition, from total darkness to full sunlight. They are also night-vision device compatible.

While red dot sights can only be used with small arms, the holographic weapon sights can be installed on machine guns, shoulder-launched and non-lethal weapons.

No matter how the shooter moves the head or eye, the reticle pattern will remain in the same place on the target. The operator can look at the target with both eyes open, while maintaining peripheral vision to potentially engage multiple targets, Gallagher said.

The HWS is compatible with night vision goggles, said Gallagher. The holographic sight functions with conventional AA batteries. It can use lithium, alkaline or rechargeable batteries, said Gallagher.

The HWS can operate at temperatures of minus 40 to 150 degrees Fahrenheit. It is waterproof, and even can be used under water, said Gallagher.

The sights can survive drops from as high as 10 feet and have been tested on heavy resonance weaponry, such as the General Dynamics' tri barrel .50 caliber Gatling gun, said Gallagher.

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